

**EFFECTIVENESS OF MIRROR THERAPY ON HAND  
RELATED FUNCTIONING OF PATIENTS WITH  
CEREBROVASCULAR ACCIDENT AT  
SRI RAMAKRISHNA HOSPITAL, COIMBATORE**

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# **EFFECTIVENESS OF MIRROR THERAPY ON HAND RELATED FUNCTIONING OF PATIENTS WITH CEREBROVASCULAR ACCIDENT AT SRI RAMAKRISHNA HOSPITAL, COIMBATORE**

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### **Abstract**

An interventional study was conducted to assess the effect of mirror therapy on Cerebrovascular accident patient hand function in Sri Ramakrishna Hospital, Coimbatore. Quasi experimental Pretest and Posttest with control group were used to conduct the study. A purposive sample of 16 Cerebrovascular accident patient have hemi paresis was included in this study. Mirror therapy was applied every day three sessions (morning, afternoon, evening) each session 30 minutes along with rehabilitation modified Ashworth Scale (MAS) for spasticity, motor recovery assessed by Burnnstrom scale and hand related functioning assessed by modified FIM instrument scale was used to assess the Hand function before and after mirror therapy. The obtained data were analyzed using paired't' test. The result shows that there is significant improvement in hand functioning like wrist flexion, wrist extension, finger abduction, finger adduction. Hence, it is concluded that Mirror therapy is found to be effective in Cerebrovascular accident patient.

**Effectiveness of Mirror Therapy on Hand Related Functioning  
among Patients with Cerebrovascular Accident at  
Sri Ramakrishna Hospital, Coimbatore**

Brain is the functional unit of central nervous system. Any disturbance in the cerebral circulation alters the entire homeostasis. Cerebrovascular accident is defined as the sudden neurological deficit occurs due to decreased (ischemia) blood supply to the brain cell or hemorrhage (Brunner, 2008).

A stroke occurs when an artery to the brain becomes blocked or ruptures, resulting in death of an area of brain tissue (cerebral infarction) and causing sudden symptoms like sensory and motor deficit, which result in loss of functions.

Most strokes are ischemic (usually due to blockage of an artery), but some are hemorrhagic (due to rupture of an artery). Transient ischemic attacks resemble ischemic strokes except the symptoms resolve within one hour. Symptoms occur suddenly and can include muscle weakness, paralysis, abnormal or lost sensation on one side of the body, difficulty speaking, confusion, problems with vision, dizziness and loss of balance and coordination (Giroux & Sirigu, 2003). Diagnosis is based on symptoms but imaging and blood tests are also done. Recovery after a stroke depends on many factors, such as the location and amount of damage, the person's age and the presence of other disorders. Controlling high blood pressure, high cholesterol levels and high blood sugar levels and not smoking help to prevent strokes.

Blood supply to the brain is through two pairs of large arteries. The damage that results depends upon how long brain cells are deprived of blood. If they are deprived for only a brief time, brain cells are stressed, but they may recover. If brain cells deprived longer (but possibly for only several minutes), brain cells die, and some functions may be lost. However, in such cases, a different area of the brain can sometimes learn how to do the functions previously done by the damaged area.

### **1.1. NEED FOR THE STUDY**

Stroke is one of the leading causes of adult disability. Disabled upper limb is a common and undesirable result of stroke that increases activity limitation. Hand is one of the most frequency and sophisticated biological motor system. Almost all activities in our life have done by our hands but stroke often cause at least temporary paralysis on one side of the body including hand and fingers. And the patients affected by stroke lose their upper extremity motor control and functioning.

Disability to use the hand due to stroke affects one's overall functional abilities. Patient's affected by stroke who lose their control over upper extremity have to be dependent on other to do their activities of daily living like eating, bathing, dressing etc. It affects their overall lifestyle and makes them to feel dependent and psychological affected.

There are various rehabilitation methods in improving upper extremity motor control and functioning, such as exercise training of the paralysis arm, impairment – oriented training of the arm, functional electric stimulation, robotic assisted rehabilitation, and bilateral arm training. However, most of the treatment protocols for the paralysis upper extremity and labour intensive and require one to one manual

interaction with therapist for several weeks, which makes the provision of intensive treatment for all patients difficult. It has been suggested that mirror therapy is a simple, inexpensive and most importantly, patient-directed treatment that may improve upper extremity function.

The therapy helps in to enhance the faster or quicker regaining of the functional level of hand and reduces the rehabilitation programme period. The Cerebrovascular accident patient regains quickly to do their daily activities.

Based on the above mentioned reasons, the researcher was interested in studying the effectiveness of mirror therapy on hand related functioning, which is a simple, safe and relatively less expensive procedure to improve hand functioning among patients with Cerebrovascular accident.

## **1.2. STATEMENT OF THE PROBLEM**

EFFECTIVENESS OF MIRROR THERAPY ON HAND RELATED  
FUNCTIONING OF PATIENTS WITH CEREBROVASCULAR ACCIDENT AT  
SRI RAMAKRISHNA HOSPITAL, COIMBATORE

## **1.3. OBJECTIVES**

- 1.3.1. To assess the hand functioning of the patient with Cerebrovascular accident.
- 1.3.2. To implement the mirror therapy for Cerebrovascular accident patient.
- 1.3.3. To assess the hand functioning after mirror therapy.

## **1.4. OPERATIONAL DEFINITION**

### **1.4.1. Stroke**

Stroke is a neurological deficit of Cerebrovascular accident that persists beyond 24 hours or is interrupted by death within 24 hours.

### **1.4.2. Mirror Therapy**

Mirror therapy is a form of motor imagery in which a mirror is used to convey visual stimuli to the brain through observation of one's unaffected body part as it carries out a set of movement.

### **1.4.3. Hand Functioning**

Hand functioning is the ability of synchronized actions of muscles and nerves in the hand to do various works.

## **1.5. CONCEPTUAL FRAMEWORK**

Conceptual framework of this study is derived from General System Theory formulated by Ludwig Von Bertalanffy in 1968. It is a visual diagram by which researcher explains the specific area of interest. This theoretical framework is used in the present study to evaluate the effectiveness of mirror therapy on hand related function among Cerebrovascular accident patient (Hemi paresis).

The component of the system include

1.5.1. Input

1.5.2. Throughput

1.5.3. Output

1.5.4. Feedback

**1.5.1. Input**

Input begins with establishing a therapeutic relationship with Cerebrovascular accident. In this phase the nurse researcher identifies demographic variables such as age, sex, education, occupation, paralysis side and assessing the hand function of Cerebrovascular accident. In this study the input is assessing of hand function among Cerebrovascular accident patient.

**1.5.2. Throughput**

The information obtained from modified Ashworth Scale, Brunnstrom Stage of Recovery, FIM – Scale for self care, hand function and administer mirror therapy to experimental group of Cerebrovascular accident patient. Mirror therapy was not given for control group.

**1.5.3. Output**

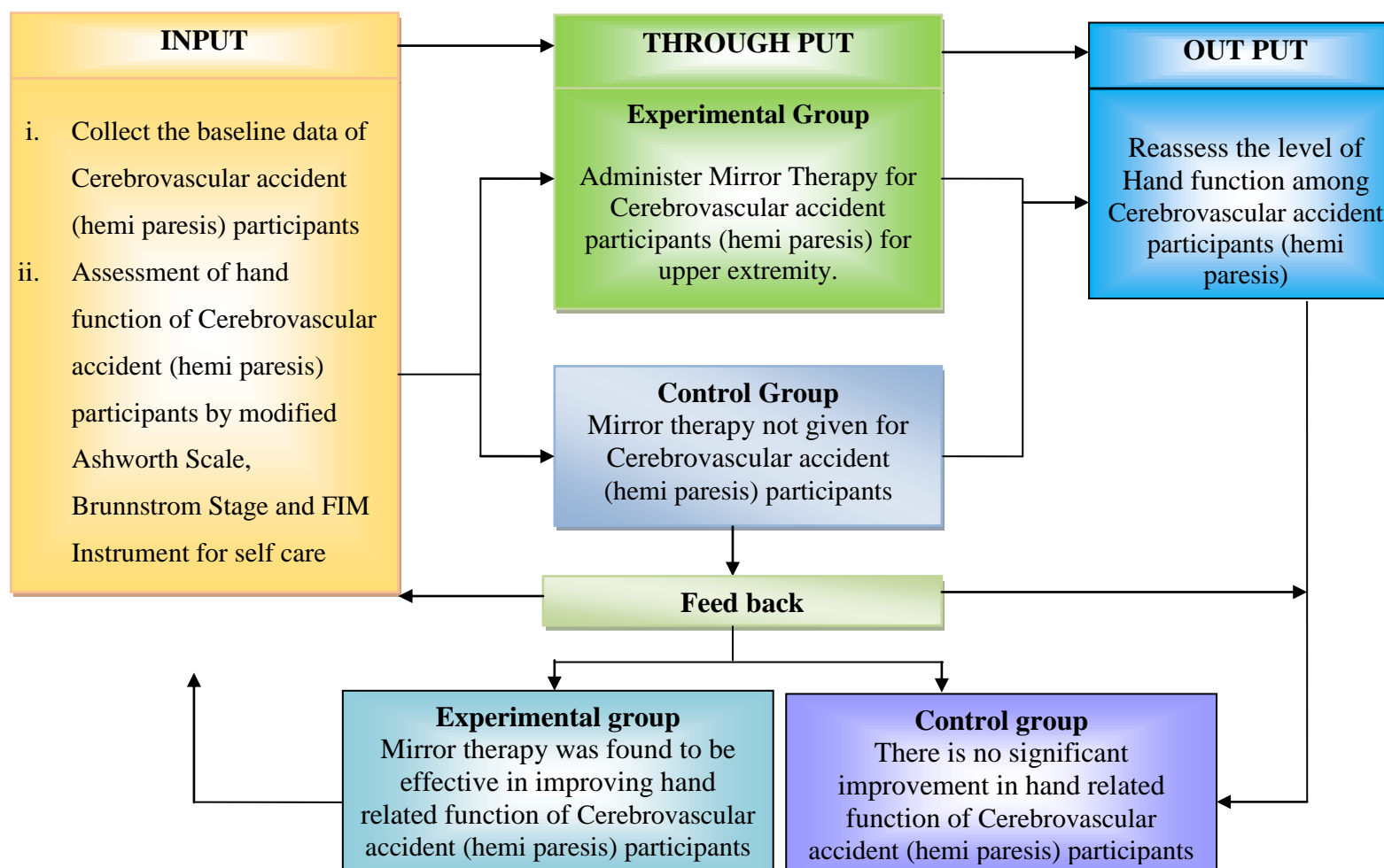
This phase includes identifying the effect of mirror therapy on Cerebrovascular accident patient. The output is measured by comparing the significant mean difference between pretest and post test.

**1.5.4. Feedback**

Mirror therapy was found effective in hemi paresis Cerebrovascular accident patient.



**FIG. 1.1.**  
**MODIFIED CONCEPTUAL FRAMEWORK BASED ON**  
**GENERAL SYSTEM THEORY BY LUDWIG VON BERTALANFFY(1968)**



Source: Kozier (2008)

### **1.6. PROJECTED OUTCOME**

Mirror therapy was found to be effective in improving the progress of hand functioning among Cerebrovascular accident patient (hemi paresis).

## **REVIEW OF LITERATURE**

This chapter discuss about the review of literature related to the study.

The literature review is discussed under the following headings:

- 2.1. Literature related to Cerebrovascular accident (CVA)
- 2.2. Literature related to mirror therapy
- 2.3. Literature related to the use of mirror therapy for the rehabilitation of  
Upper limb affected by stroke.

### **2.1. LITERATURE RELATED TO CEREBROVASCULAR ACCIDENT**

A study was conducted by Joshi (Technical Officer) and Dhar (Director) of Medical Research centre, Bombay Hospital, Marine lines, Mumbai to find incidence and risk of Cerebrovascular Accident (Stroke) in different age groups. 105 patients (20 – 94 years) of stroke admitted to Medical Research Centre, Bombay Hospital during the year 1996 (Jan-Dec) were included in this study. The incidence was analyzed as per age group < 40, 40-59, 60 and above. The risk factors, such as hypertension, diabetes and altered Lactic Dehydrogenase (LDH), Serum Glutamate Oxalate Transaminase (SGOT), Serum Glutamic Pyruvate Transaminase (SGPT), serum lipids, High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL) were included. Effect of various drugs e.g. anti-hypertensive, anti-platelet agents and anti-coagulants in delaying mortality were also studied. The results show that Strokes constitute 9.37 % of total neurological cases and maximum strokes are cerebral. The incidence increased with age. Left infarct was predominant (62.5 %) in young compared to elderly (50.5 %) while right infarct is more in elderly (45.4 %) than young (37.5 %). Multiinfarct (4.13 %) occurs only in elderly. Low serum

cholesterol (23.5 %) and low hemoglobin (20 %) values were observed in strokes. Both hypertension 61.0 % and diabetes 35.24 % are risk factors contributing to high mortality in elderly.

Another study was conducted by Patel (1989) to find the prevalence of Cerebrovascular accident in 4349 cases of diabetes admitted in the Bombay Hospital, Bombay between 1967 and 1975. The results show that the Prevalence of Cerebrovascular accident in 4349 cases of diabetes admitted in the Bombay Hospital, Bombay between 1967 and 1975 was in 411 (9.45 %) cases. Number of males predominated, but was of no significance as compared to the occurrence of Cerebrovascular in females. Highest number of cases were in the age group of 61-70 years (statistically significant), which was a decade higher than the age of (51-60 years) maximum number of admitted cases in 4349 cases. The mortality increases with age, highest in age above 70 years-statistically significant. The type and site of Cerebrovascular accident had no relation to the age group or sex, duration and severity of diabetes. Cerebrovascular accident was much less in the last three months of the year and was highest in the month of June, and is of no statistical significance. Cerebrovascular accident was more prevalent in mild type diabetes, but mortality was higher in severe type of diabetes. Cerebrovascular accident was prevalent in all types of blood pressure, but had highest mortality in severe hypertension. Occurrence of Cerebrovascular accident had no relation with the duration of diabetes.

Raphael Carandang (1948) conducted a study to determine long-term trends in the incidence, lifetime risk, severity, and 30-day risk of death from clinical stroke. This study included 9,152 Framingham Study original patient and offspring

undergoing follow-up for up to 50 years over three consecutive time-periods (1950-1977, 1978-1989, and 1990-2004), with ascertainment of stroke risk factor data every two years and active surveillance for occurrence of stroke or death.

The researchers found that the age-adjusted annual incidence of clinical stroke and Atherothrombotic Brain Infarctions in participant's age 55 to 94 years decreased over the 3 periods. The incidence of clinical stroke decreased significantly. Across the 3 periods, the lifetime risk of clinical stroke (by age 90 years) decreased from 19.5 % to 14.5 % in men age 65 years and from 18.0 % to 16.1 % in women. Age-adjusted stroke severity did not vary across periods; however, death within 30 days of stroke decreased significantly in men (from 23 % to 14 %) but not significantly in women (from 21 % to 20 %).

The severity of stroke has not decreased and 30 day mortality has decreased significantly only in men, perhaps due to an older age at onset of stroke and more severe strokes in women. These sobering trends emphasize that while improved control of risk factors has lowered incidence of stroke, there is a need for greater primary prevention efforts to reduce the lifetime risk, severity, and 30 day mortality following stroke, the authors conclude.

The study was conducted by Shyamlal Das, Professor in Bangur Institute of Neurology, Kolkatta, along with his colleagues in Kolkata city to determine the subtypes, prevalence, incidence, and case fatality rates of stroke. This was a longitudinal descriptive study comprising two stage door-to-door survey of a stratified randomly selected sample of the city population, conducted twice per year for two successive years from March 2003 to February 2005. The results show that out of the

screened population of 52,377 (27,626 men & 24,751 women), the age standardized prevalence rate of stroke to world standard population is 545.10 (95 %, 479.86 to 617.05) per 1,00,000 persons. The age standardized average annual incidence rate to world standard population of first-ever-in-a-lifetime stroke is 145.30 (95 %, 120.39 to 174.74) per 1,00,000 persons per year. Thirty-day case fatality rate is 41.08 % (95 %, 30.66 to 53.80). Women have higher incidence and case fatality rates. Despite divergence on socioeconomic status between the slum and non-slum dwellers, stroke parameters were not significantly different.

Stoykov (2003), Rehabilitation Institute of Chicago, conducted a study to compare the effectiveness of bilateral training with unilateral training for individuals with moderate upper limb hemi paresis. The authors hypothesized that bilateral training would be superior to unilateral training in the proximal extremity but not the distal one. Twenty-four subjects participated in a randomized, single-blind training study. Subjects in the bilateral group (n=12) practiced bilateral symmetrical activities, whereas the unilateral group (n=12) performed the same activity with the affected arm only. The activities consisted of reaching-based tasks that were both rhythmic and discrete. The Motor Assessment Scale (MAS), Motor Status Scale (MSS), and muscle strength were used as outcome measures. Assessments were administered at baseline and post-training by a rater blinded to group assignment. Both groups had significant improvements on the Motor Status Scale (MSS) and measures of strength. The bilateral group had significantly greater improvement on the Upper Arm Function scale (a subscale of the Motor Assessment Scale (MAS), Upper Limb Items). Both bilateral and unilateral training are efficacious for moderately impaired chronic stroke survivors. Bilateral training may be more advantageous for proximal arm function.

Brashear, et al (2003) Department of Neurology, Indiana University School of Medicine, Indianapolis, conducted a study to determine if botulinum toxin type B (MyoBloc) decreases spasticity. Ten patients with stable upper-limb spasticity and an Ashworth Scale score of two or higher at the elbow, wrist, and fingers. Total dose of 10,000U of botulinum toxin type B injected into five major muscles. The Ashworth Scale, goniometry, and functional assessments were performed at injection and weeks 4, 8, and 12. The Principal Investigator (PI) Global Assessment of Change (GAC) and the patient Global Assessment of Change (GAC) were done at weeks 4, 8, and 12 post-injection. The safety of the procedure was measured by adverse events and vital signs. Improvements in Ashworth Scale scores were observed at weeks 4, 8, and 12 post-injection. At week 4, the mean changes (in Ashworth score) were elbow, -1.0 (P=.016); wrist, -1.7 (P=.004); finger, -1.35 (P=.02); at week 8: elbow, -.83 (P=.016); wrist, -1.00 (P=.016); finger, -.94 (P=.08); and at week 12: elbow, -.61 (P=.07); wrist, -1.00 (P=.016); and finger, -.89 (P=.10). The Principal Investigator Global Assessment of Change improved at all visits. Nine of the 10 subjects reported dry mouth at week 4, with resolution by week 12. No changes were seen on the functional measures. Therefore, Botulinum toxin type B may be useful in treatment of spasticity.

## **2.2. LITERATURE RELATED TO MIRROR THERAPY**

Brenda, et al (2007) conducted a randomized, sham-controlled trial of mirror therapy versus imagery therapy involving patients with phantom limb pain after the amputation of a leg or foot.

They randomly assigned 22 patients to one of three groups: one that viewed a reflected image of their intact foot in a mirror (mirror group), one that viewed a covered mirror, and one that was trained in mental visualization. The patients were told that each therapy was being examined for efficacy, and each patient provided written informed consent. Eighteen subjects (six in each group) completed the study. Patients in the mirror group attempted to perform movements with the amputated limb while viewing the reflected image of the movement of their intact limb. Patients in the covered-mirror group attempted to perform movements with both their intact and amputated limbs when the mirror was covered by an opaque sheet. Patients in the mental-visualization group closed their eyes and imagined performing movements with their amputated limb.

Under direct observation, patients performed their assigned therapy for 15 minutes daily. They also recorded the number and duration of pain episodes and the intensity of pain with the use of a 100-mm visual-analogue scale; they also recorded the number and duration of pain episodes. The primary end point was the severity of pain after 4 weeks of therapy. Baseline scores on the visual-analogue scale were similar among the groups ( $P=0.62$ ). Pain intensity decreased with mirror treatment, as did the number and duration of pain episodes. After 4 weeks of treatment, 100% of patients in the mirror group reported a decrease in pain (median change on the visual-analogue scale, -24 mm; range, -54 to -13), but two patients had brief reactions (<2 minutes) of grief on viewing the reflected intact lower limb. In contrast, in the covered-mirror group, only one patient (17 %) reported a decrease in pain, whereas three patients (50 %) reported worsening pain. In the mental-visualization group, two patients (33 %) reported a decrease in pain, whereas four patients (67 %) reported



worsening pain. In a comparison of changes in the score on the visual-analogue scale at 4 weeks, the mirror group differed significantly from both the covered-mirror group ( $P=0.04$ ) and the mental-visualization group ( $P=0.002$ ). Phantom limb pain decreased in eight of nine patients (89 %) who switched to mirror therapy from either a covered mirror or mental visualization ( $P=0.008$  for both comparisons of scores on the visual-analogue scale at four weeks with those at 8 weeks).

Their findings showed that mirror therapy reduced phantom limb pain in patients who had undergone amputation of lower limbs. Such pain was not reduced by either covered-mirror or mental-visualization treatment. Pain relief associated with mirror therapy may be due to the activation of mirror neurons in the hemisphere of the brain that is contralateral to the amputated limb. These neurons fire when a person either performs an action or observes another person performing an action. Alternatively, visual input of what appears to be movement of the amputated limb might reduce the activity of systems that perceive protopathic pain. Although the underlying mechanism accounting for the success of this therapy remains to be elucidated, these results suggest that mirror therapy may be helpful in alleviating phantom pain in an amputated lower limb.

Angelo Cacchio, et al (2009) conducted a randomized, sham-controlled study involving 24 patients with stroke (11 men and 13 women). The median age was 62 years (range, 53 to 71), and the median time since stroke was 14 months (range, 7 to 21). Chronic complex regional pain syndrome type 1 of a paralysis arm was diagnosed according to the criteria of Bruehl and colleagues. The investigators were unaware of the study-group assignments. Of the 24 patients, 15 (62 %) had left

hemiplegia and 19 (79 %) had ischemic stroke. No cases of thalamic involvement or shoulder subluxation were recorded. None of the patients had signs of depression.

They randomly assigned the 24 patients to one of three groups: one that viewed a reflected image of their unaffected arm in a mirror (the active-mirror group), one that viewed a covered mirror (the covered-mirror group), and one that received training in mental imagery (the mental-imagery group). All patients provided written informed consent.

In both the active-mirror and covered-mirror groups, patients performed all of the cardinal (proximal to distal) movements of the affected arm for 30 minutes daily. Outcomes were measured in terms of pain on movement. The primary end point was the score for the severity of pain after 4 weeks of therapy, based on a visual-analogue scale from 0 to 100 mm, with higher scores indicating more severe pain. Secondary end points were motor function as assessed by the Wolf motor-function test, brush-induced allodynia, and edema after 4 weeks of therapy. The analysis-of-variance test was used. Baseline scores for pain on the visual-analogue scale were similar among the three groups ( $P=0.71$ ). After 4 weeks of active-mirror therapy, the pain intensity decreased and motor function, brush-induced allodynia, and edema improved.

Their results indicate that, unlike imagery therapy, mirror therapy effectively reduces pain and enhances motor function in the arm of patients with stroke and chronic complex regional pain syndrome type 1 in the arm. The traditional view that in patients with stroke, chronic complex regional pain syndrome type 1 in the arm is refractory to mirror therapy needs to be reconsidered.

### **2.3. LITERATURE RELATED TO THE USE OF MIRROR THERAPY FOR THE REHABILITATION OF UPPER LIMB AFFECTED BY STROKE**

Christian Dohle, et al (2008) conducted a randomized controlled trial to evaluate the effect of a therapy that includes use of a mirror to simulate the affected upper extremity with the unaffected upper extremity early after stroke. Thirty-six patients with severe hemi paresis because of a first-ever ischemic stroke in the territory of the middle cerebral artery were enrolled, no more than eight weeks after the stroke. They completed a protocol of six weeks of additional therapy (30 minutes a day, five days a week), with random assignment to either Mirror Therapy (MT) or an equivalent Control Therapy (CT). The main outcome measures were the Fugl-Meyer sub scores for the upper extremity, evaluated by independent raters through videotape. Patients also underwent functional and neuropsychological testing. In the subgroup of 25 patients with distal plegia at the beginning of the therapy, Mirror Therapy patients regained more distal function than Control Therapy patients. Furthermore, across all patients, Mirror Therapy improved recovery of surface sensibility. Neither of these effects depended on the side of the lesioned hemisphere. Mirror Therapy stimulated recovery from hemi neglect. Mirror Therapy early after stroke is a promising method to improve sensory and attention deficits and to support motor recovery in a disabled limb.

Another Study was conducted by Michielsen, et al (2010) forty patients with chronic stroke (mean time 3.9 years post onset) participated in a randomized controlled trial to determine the effect of mirror therapy on upper extremity function and whether mirror therapy can induce cortical reorganization. Subjects were randomly assigned to a mirror therapy group (n=20) or a control group (n=20). The

mirror therapy group performed bimanual exercises while watching the unaffected hand in a mirror, during physiotherapy sessions 1x/week and 1-hour practice sessions at home 5x/week. The control group performed bimanual exercises at the same frequency and duration, with sight of both hands. Measures were administered at baseline, six weeks (post-treatment) and 6 months (follow-up) and included motor function as measured by the upper extremity component of the Fugl-Meyer Motor Assessment (FMA), grip force as measured by a Jamar handheld dynamometer, spasticity as measured by the Tardieu scale, pain as measured by a visual analogue scale, motor capacity as measured by the Action Research Arm Test, self-perceived performance as measured by the ABILHAND questionnaire, actual performance over 24 hours as measured by the Stroke-ULAM (taken as a ratio between the amount of use of the unaffected and affected arms), and quality of life as measured by the EQ-5D. The Stroke - ULAM was not readministered at 6 months due to the inconvenience of the assessment on patient. The effects of mirror therapy on cortical reorganization were measured as a calculation in the change in activation balance between affected and unaffected hemispheres (weighted laterality difference) on fMRI. At post-treatment (6 weeks) a significant between-group difference was seen for motor function (FMA) in favour of the intervention group as compared to the control group ( $p=0.04$ ), but was not evident on follow-up assessment at 6 months. No significant between-group differences were seen for other upper limb outcomes. Results from fMRI indicated a significant change in the activation balance in the primary motor cortex region, in favour of the intervention group as compared to the control group (weighted laterality difference,  $p<0.05$ ).

Nine patients with chronic stroke (mean time 4.8 years since onset) participated in a cross-over design study conducted by Altschuler (1999) et al to investigate the effect of mirror therapy on upper limb movement ability. Patient were randomly assigned to a mirror therapy group or a control group for 4 weeks before crossing to the other intervention for a further 4 weeks. Both groups completed a similar regime of therapy for 15 minutes a day, twice a day for 6 days, during which time they performed bilateral symmetrical arm and hand movements. The mirror therapy group watched the unaffected arm in the mirror while the control group watched the paralysis arms through transparent plastic. Cardinal upper limb movements assessed for change in range of motion, speed and accuracy from baseline performance at 2, 4, 6 and 8 weeks of intervention, using a rating scale of -3 to +3, where 0 indicated no change. Substantially more patients were considered to demonstrate improved cardinal upper limb movements in the mirror therapy group as compared to the control group. Subjective data indicated that patient preferred mirror therapy to the control therapy and found it more helpful. This study did not provide statistical analysis of data.

Ezendam, Bongers & Jannink (2009) conducted a systematic review of studies regarding the use of mirror therapy in upper extremity rehabilitation of patients with stroke, chronic regional pain syndrome, amputation, hand surgery other than amputation, or differentiation pain following amputation, partial spinal cord injury, brachial plexus lesion or traumatic peripheral nerve lesion. The authors searched the PubMed database for full-length publications in peer-reviewed journals published from 1970 to 2008. Of the 15 studies suitable for inclusion, 5 studies involved patients with sub acute or chronic stroke. There was heterogeneity among studies with regard

to the treatment regime, control therapy, duration and frequency of intervention, and outcomes measured. Nonetheless, the authors concluded a positive result of mirror therapy on motor function of patients with stroke.

Cacchio, et al (2009) conducted a trial to find the effect of mirror therapy in complex regional pain syndrome type 1 of the upper limb in stroke patients. 48 patients with subacute stroke and complex regional pain syndrome type 1 were randomized to receive mirror therapy and conventional rehabilitation (MT group, n=24), or conventional rehabilitation alone (CR group, n=24). Conventional rehabilitation comprised 1-hour sessions of neurorehabilitation techniques, occupational therapy and speech pathology (where necessary), 5 days a week for 4 weeks. The MT group received an additional 30 minutes (week 1 and 2) to 1 hour (week 3 and 4) per session of mirror therapy comprising movements of the unaffected upper limb (shoulder, elbow and wrist flexion and extension; forearm pronation-supination). The control group performed the same exercises for the same duration, although the mirror was covered to remove the reflection of the unaffected upper limb. Measures were taken at baseline, one week following intervention (post-treatment) and 6 months (follow-up) and included: pain at rest, on shoulder flexion, and during brushing within the area of maximal pain (tactile allodynia), measured using a visual analogue scale; and function, measured by the Wolf Motor Function Test – Functional Ability (WMFT-FA) and – Performance Time (WMFT-PT) subtests and the Motor Activity Log – Quality of Movement (MAL-QOM) subtest. Significant between-group differences in pain at rest, on movement and for tactile allodynia were seen in favour of the MT group compared to the CR group at post-treatment and follow-up ( $p<0.001$ ). The MT group also demonstrated a significant reduction in pain

at rest, on movement and with tactile allodynia at post-treatment and follow-up ( $p<0.001$ ). Significant between-group differences were also seen on all measures of function at post-treatment and follow-up ( $p<0.001$ ), in favour of the MT group compared to the CR group. The MT group demonstrated a significant improvement in WMFT-FA, WMFT-PT and MAL-QOM scores at post-treatment and follow-up ( $p<0.001$ ). The control group demonstrated a significant deterioration in WMFT – Functional Ability scores at follow-up ( $p<0.01$ ).

Santilli (2009) conducted a study to find the effect of Mirror therapy for chronic complex regional pain syndrome type 1 and stroke. 24 patients with chronic stroke and complex regional pain syndrome type 1 were randomized to: (i) an active mirror group (AM group,  $n=8$ ) that viewed a reflection of the unaffected arm in a mirror; (ii) a covered mirror group (CM group,  $n=8$ ) that performed movements of the unaffected arm in front of a covered mirror; or (iii) a mental imagery group (MI group,  $n=8$ ). The AM and CM groups performed principal (proximal to distal) movements of the affected arm for 30 minutes daily for 4 weeks. Treatment regime for the MI group was not specified. Measures were taken at baseline and 4 weeks (post-treatment) and included: (i) pain, measured by a visual analogue scale; (ii) function, measured by the Wolf Motor Function Test; (iii) brush-induced allodynia; and (iv) oedema. At 4 weeks a significant between-group difference in pain was found in favour of the AM group compared to the CM group ( $p=0.002$ ) and the MI group ( $p<0.001$ ). After the 4-week treatment period 12 patients crossed over to the AM group. A significant reduction in pain was reported among patient that moved from the CM group to the AM group ( $p=0.002$ ), and among those who moved from the MI

group to the AM group ( $p=0.004$ ). Results for other outcome measures were not reported post-treatment or post-crossover.

Rothgangel (2011) conducted a systematic review of studies regarding the use of mirror therapy interventions with adult patients with stroke, phantom limb pain and complex regional pain syndrome. The authors searched databases prior to August 2010 for related RCTs, nonrandomized controlled clinical trial studies (CCTs) and other studies (e.g. case series) in English, German, French or Dutch. Mirror therapy was defined as use of a parasagittal mirror or modified mirror device to superimpose movements of the unaffected limb on the affected limb. Of the 21 studies suitable for inclusion, 10 studies (6 RCTs and 4 non-controlled studies) involved patients with stroke. Studies were required to include outcome measures of activity level in patients with stroke, although there was heterogeneity among studies in the measures used. All 6 RCTs used a parasagittal mirror and the intervention was typically used in conjunction with conventional therapy. The treatment regime varied from 30 – 60 minutes daily, 2 – 7 days/week for 4 – 6 weeks, with even greater variation among non-controlled studies. Control therapies included mental practice, direct observation of the affected limb, transparent plastic instead of a mirror, or use of the non-reflective side of a mirror. Review of the literature revealed moderate evidence to indicate that mirror therapy (as an additional intervention) improves recovery of arm function, but low evidence to indicate that mirror therapy improves lower limb function or pain after stroke.



Yavuzer of Department of Physical Medicine and Rehabilitation, Ankara University Faculty of Medicine, Ankara, Turkey conducted a Randomized, controlled, assessor-blinded, 4-week trial, with follow-up at 6 months to evaluate the effects of mirror therapy on upper-extremity motor recovery, spasticity, and hand-related functioning of inpatients with sub acute stroke. A total of 40 inpatients with stroke (mean age, 63.2y), all within 12 months post stroke. Thirty minutes of mirror therapy program a day consisting of wrist and finger flexion and extension movements or sham therapy in addition to conventional stroke rehabilitation program, 5 days a week, 2 to 5 hours a day, for 4 weeks. The Brunnstrom stages of motor recovery, spasticity assessed by the Modified Ashworth Scale (MAS), and hand-related functioning (self-care items of the FIM instrument). The scores of the Brunnstrom stages for the hand and upper extremity and the FIM self-care score improved more in the mirror group than in the control group after 4 weeks of treatment (by 0.83, 0.89, and 4.10, respectively; all  $P<.01$ ) and at the 6-month follow-up (by 0.16, 0.43, and 2.34, respectively; all  $P<.05$ ). No significant differences were found between the groups for the MAS. In the group of sub acute stroke patients, hand functioning improved more after mirror therapy in addition to a conventional rehabilitation program compared with a control treatment immediately after 4 weeks of treatment and at the 6 months follow-up.

Ezendam (2009) conducted a research regarding the effectiveness of mirror therapy in upper extremity function. A systematic literature search was performed to identify studies concerning mirror therapy in upper extremity. The included journal articles were reviewed according to a structured diagram and the methodological quality was assessed. Fifteen studies were identified and reviewed. Five different

patient categories were studied: two studies focused on mirror therapy after an amputation of the upper limb, five studies focused on mirror therapy after stroke, five studies focused on mirror therapy with complex regional pain syndrome type 1 (CRPS1) patients, one study on mirror therapy with complex regional pain syndrome type 2 (CRPS2) and two studies focused on mirror therapy after hand surgery other than amputation. Most of the evidence for mirror therapy is from studies with weak methodological quality. The present review showed a trend that mirror therapy is effective in upper limb treatment of stroke patients and patients with CRPS, whereas the effectiveness in other patient groups has yet to be determined.

Koen (2009) conducted a study to identify neural networks associated with the use of a mirror to superimpose movement of 1 hand on top of a nonmoving contralateral hand (often referred to as mirror therapy or mirror-induced visual illusion). A Functional Magnetic Resonance Imaging (fMRI) study of mirror-induced visual illusion of hand movements using a blocked design in a 1.5 T magnetic resonance imaging scanner. Neural activation was compared in a no-mirror experiment and a mirror experiment. Both experiments consisted of blocks of finger tapping of the right hand versus rest. In the mirror experiment, movement of the left hand was simulated by mirror reflection of right hand movement. Eighteen healthy subjects were taken part in the study. Differences in fMRI activation between the 2 experiments were taken into account. In the mirror experiment, they found supplementary activation compared with the no-mirror experiment in 2 visual areas: the right Superior Temporal Gyrus (STG) and the right superior occipital gyrus. In this study, they found two areas uniquely associated with the mirror-induced visual illusion of hand movements: the right STG and the right superior occipital gyrus. The

STG is a higher-order visual region involved in the analysis of biological stimuli and is activated by observation of biological motion. The right superior occipital gyrus is located in the secondary visual cortex within the dorsal visual stream. In the literature, the STG has been linked with the mirror neuron system. However, we did not find activation within the front parietal mirror neuron system to support further a link with the mirror neuron system. Future studies are needed to explore the mechanism of mirror induced visual illusions in patient populations in more detail.

Rothgangel (2011) conducted a study to evaluate the clinical aspects of Mirror Therapy (MT) interventions after stroke, phantom limb pain and complex regional pain syndrome. A systematic literature search of the Cochrane Database of controlled trials, PubMed/MEDLINE, CINAHL, EMBASE, PsycINFO, PEDro, RehabTrials and Rehadat, was made by two investigators independently. No restrictions were made regarding study design and type or localization of stroke, complex regional pain syndrome and amputation. Only studies that had MT given as a long-term treatment were included. Two authors (A.S.R. and S.M.B.) independently assessed studies for eligibility and risk of bias by using the Amsterdam-Maastricht Consensus List. Ten randomized trials, seven patient series and four single-case studies were included. The studies were heterogeneous regarding design, size, conditions studied and outcome measures. Methodological quality varied; only a few studies were of high quality. Important clinical aspects, such as assessment of possible side effects, were only insufficiently addressed. For stroke there is a moderate quality of evidence that MT as an additional intervention improves recovery of arm function, and a low quality of evidence regarding lower limb function and pain after stroke. The quality of evidence in patients with complex regional pain syndrome and phantom limb pain is also low.

Firm conclusions could not be drawn. Little is known about which patients are likely to benefit most from MT, and how MT should preferably be applied. Future studies with clear descriptions of intervention protocols should focus on standardized outcome measures and systematically register adverse effects.

## **METHODOLOGY**

This chapter describes the research methodology adopted to assess the effect of Mirror therapy on hand related functioning among patient with Cerebrovascular accident at Sri Ramakrishna Hospital, Coimbatore. The methodology of the present study includes research design, setting, population, criteria for sample selection, sampling technique, variables of the study, development and description of tools, validity of the tool, hypothesis, pilot study, main study and technique of data analysis and interpretation.

### **3.1. RESEARCH APPROACH**

The present study aimed at determining the effect of Mirror therapy among Cerebrovascular patient at Sri Ramakrishna Hospital, Coimbatore.

### **3.2. RESEARCH DESIGN**

The research design selected for the study was Quasi Experimental Design. Pretest – Post test Control Group Design was found to be appropriate to evaluate the effectiveness of mirror therapy on depression among depressive patients at Sri Ramakrishna Hospital, Coimbatore.

### **3.3. SETTING**

The study was conducted in Neuro Ward, Sri Ramakrishna Hospital, Coimbatore. The hospital was established in 1972 with 550 beds. Neuro ward consist of 20 beds.

### **3.4. POPULATION**

The target population for the present study was patient with Cerebrovascular accident at Sri Ramakrishna Hospital, Coimbatore. The total number of patient admitted in neuro ward was 23 in June 2011.

### **3.5. CRITERIA FOR SAMPLE SELECTION**

The sample of subjects was taken based on following inclusive and exclusive criteria.

#### *Inclusion Criteria*

The patient with following criteria were selected for the study

- i. Patient had a first episode of unilateral stroke with hemi paresis.
- ii. Brunnstrom score stage I and IV for the upper extremity.
- iii. Patient had no severe cognitive disorders.
- iv. Both the sexes were taken for the study.

#### *Exclusion Criteria*

The patient with following criteria were excluded in the study

1. Stroke following head injury.
2. Presence of severe contracture and deformity.
3. Visually challenged patient.

### **3.6. SAMPLING**

Convenient sample of 16 Cerebrovascular accident patient was drawn as sample for the present study.

### 3.7. VARIABLES OF THE STUDY

#### 3.7.1. Independent Variable

The independent variable in the present study was mirror therapy. Hence the researchers deliberately implement mirror therapy to maximize the experimental variable.

#### 3.7.2. Dependent Variable

Dependent variable of the study was hand function.

### 3.8. MATERIALS

The following tools were used for data collection.

Demographic profile to collect the personal information about the cerebrovascular accident patient.

Modified Ashworth scale – for spasticity ( Bryan Ashworth, 1964).

Brunnstrom recovery stage of hand – for recovery of hand movement (Signe Brunnstrom, 1966 ).

Modified FIM Self-Care Scale – for functional activity measurement (guide for the Uniform Data Set for Medical Rehabilitation, 1996).

3.8.1. Demographic Data : Demographic data consists of personal information about the patient such as age of the patient, sex, education, occupation and paralysis side.

3.8.2. Modified Ashworth Scale : The Ashworth scale was created in the mid 1964 by Bryan Ashworth as a way of judging the effectiveness of anti-spastic drugs. The

modified Ashworth scale was created in 1987 by researchers Bohannon and Smith who introduced a 1+ grade to increase the sensitivity of the scale.

A rating of four on the modified scale is described as rigidity with in the affected area of the body with movement limited when extended or in flexion. When a score of 0 is recorded on the modified Ashworth scale there is usually no increase in a patient's muscle tone. The Ashworth scale is being used to measure the muscle tone on both the upper and lower areas of the body. The scale rates the ease of movement from maximal flexion to maximum extension.

### **Administration**

Although there are no standardized guidelines for its use, the modified Ashworth scale can be applied to muscles of both the upper or lower body. The rater should extend the client's limb from a position of maximal flexion to maximal extension until the first soft resistance is felt. Moving a client's limb through its full range of motion should be done within one second by counting one thousand and one (Bohannon & Smith, 1987).

Throughout testing the client should be instructed to remain calm and relaxed and when repeated testing is undertaken, testing should be initiated at the same time of the day to minimize possible changes in spasticity levels due to medication interaction (Bohannon & Smith, 1987).

*Brunnstrom Motor Recovery Stages* : The Brunnstrom approach developed by Swedish physical therapist Signe Brunnstrom. She was a Swedish physical therapist emphasizing the synergetic pattern of movement which develops during recovery



from hemiplegia. Brunnstrom (1966 & 1970) described the process of recovery following stroke-induced hemiplegia.

The process was divided into a number of stages:

Synergy: A whole series of muscles are recruited when just a few are needed. Trying to reach forward, the arm wings outward, the shoulder lifts, the wrist curls down. Lots of this is from spasticity.

1. Flaccidity (immediately after the onset)

No voluntary movements on the affected side can be initiated.

2. Spasticity appears

Basic synergy patterns appear.

Minimal voluntary movements may be present.

3. Patient gains voluntary control over synergies

Increase in spasticity.

4. Some movement patterns out of synergy are mastered (synergy patterns still predominate). Decrease in spasticity.

5. If progress continues, more complex movement combinations are learned as the basic synergies lose their dominance over motor acts. Further decrease in spasticity.

6. Disappearance of spasticity

Individual joint movements become possible and coordination approaches normal.

7. Normal function is restored.

FIM Instrument (Self Care Item): The FIM (guide for the Uniform Data Set for Medical Rehabilitation, 1996) is the most widely accepted functional assessment measure in use in the rehabilitation community. The FIM is an 18-item ordinal scale, used with all diagnosis within rehabilitation.

The FIM instrument was designed for adult rehabilitation patients and is used with a computerized analysis and reporting system. For nearly 2 decades the FIM instrument and its reporting and analysis systems were used in the various rehabilitation settings. The FIM instrument also has been embedded in a tool used by the federal government to allow comprehensive inpatient rehabilitation facilities to meet the mandated prospective payment system. Additional instruments and systems were spun off from the FIM instrument for use with different populations in different care settings.

### **Administration**

Researcher observes the self care activity of the patient and interprets with patient and records the findings.

### **Interventional procedure**

- i. Take a standard mirror ( 35 × 35 )
- ii. Position the arm.
- iii. Position the mirror across the midline of the body so that the paretic site is hidden behind the mirror reflection.
- iv. The mirror should reflect the image of the intact arm. Thus the healthy limb and the image of another healthy limb is viewed i.e., illusion of two ‘normal’ moving arm.

- v. In this way the brain encodes the information that no paralysis has occurred.
- vi. The mirror should be stabilized so that the performer is not concerned about balancing the mirror while performing the treatment.
- vii. The performer is asked to perform gentle movements while looking in the mirror for 30 minutes/ session daily.
- viii. During the session patients were asked to try to do the same movements movement with the paralysis hand while they were moving the non-paralysis hand.

### **3.9. HYPOTHESES**

Following hypothesis were formulated

- H<sub>01</sub>: There is no significant difference between experimental and control group before mirror therapy.
- H<sub>1</sub>: There is a significant difference experimental group and control group after mirror therapy.
- H<sub>02</sub>: There is a significant difference in the hand functioning scores after mirror therapy among experimental group.
- H<sub>2</sub>: There is no significant difference in the hand functioning scores after rehabilitation among control group.

### **3.10. PILOT STUDY**

Pilot study was conducted to find out the feasibility and practicability of the study. The Study was conducted at Sri Ramakrishna Hospital for the period of ten days. A convenient sample of four Cerebrovascular accident participant was selected, Two were assigned to experimental group and two were assigned to control group

randomly. Modified Ashworth scale Brunnstrom Motor Recovery Stages, FIM instrument for self care scale was used to assess the hand function status. Assessment was done three times a day. The result revealed that there was a significant improvement in the status of hand functioning after implementation of mirror therapy.

### **3.11. MAIN STUDY**

The main study was conducted to meet the objectives of the present study. The data was collected for the period of 30 days from June 2011 to July 2011 at Sri Ramakrishna Hospital. A convenient sampling of 16 patients was selected. The baseline data were obtained from records of the patients. The Hand function was assessed by Modified Ashworth Scale, Brunnstrom stage of recovery, modified FIM instrument for self care scale was used both experimental (8 patient) and control group (8 patient). Both the group received mirror therapy 3 times a day.

### **3.12. TECHNIQUE OF DATA ANALYSIS AND INTERPRETATION**

Appropriate statistical technique such as descriptive statistics, inferential statistics ('t' test) and correlation coefficient was applied to analyze the data.

## **DATA ANALYSIS AND INTERPRETATION**

This chapter deals with data analysis of effect of mirror therapy on hand functioning among Cerebrovascular accident patient at Sri Ramakrishna Hospital, Coimbatore. Data was collected from 16 patients. Data collected were tabulated and analyzed using descriptive and inferential statistical method.

### **SECTION – I**

#### **4.1. BASELINE DATA PROFILE**

Data about the patient of the study was collected from the respondents based on the tool of the study which deals with personal information of the patient with Cerebrovascular accident such as age, gender, education, occupation, paralysis side, lesion type and time of diagnosis. These data were presented in the form of tables and figures.

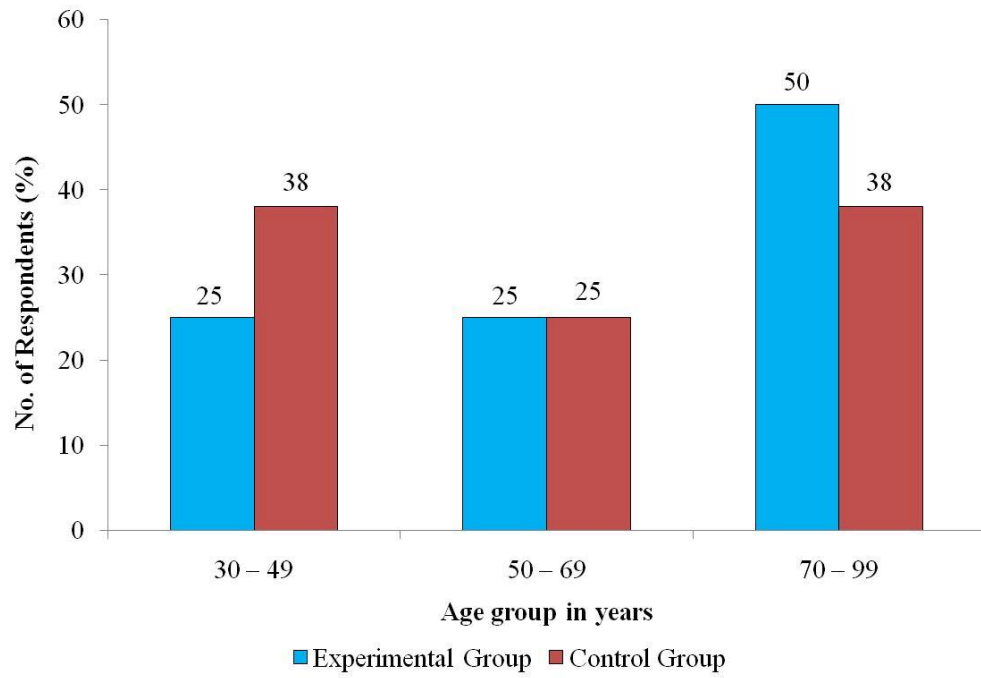
**TABLE 4.1.**  
**BASELINE DATA PRESENTATION OF THE**  
**CEREBROVASCULAR ACCIDENT PATIENT**

(N=16)

Demographic variables	Experimental group		Control group	
	No. of Patients	Percentage (%)	No. of Patients	Percentage (%)
<b>Age in years</b>				
30 – 49	2	25	3	38
50 – 69	2	25	2	25
70 – 99	4	50	3	38
<b>Education</b>				
Primary	6	75	6	75
Secondary	2	25	2	25
<b>Paretic side</b>				
Right	3	38	4	50
Left	5	62	4	50
<b>Lesion</b>				
Ischemic	5	62	5	62
Hemorrhagic	3	38	3	38
<b>Occupation</b>				
Accountant	1	13	-	-
House wife	1	13	-	-
Cooli worker	1	13	1	13
Farmer	-	-	1	13
Other	5	62	6	75

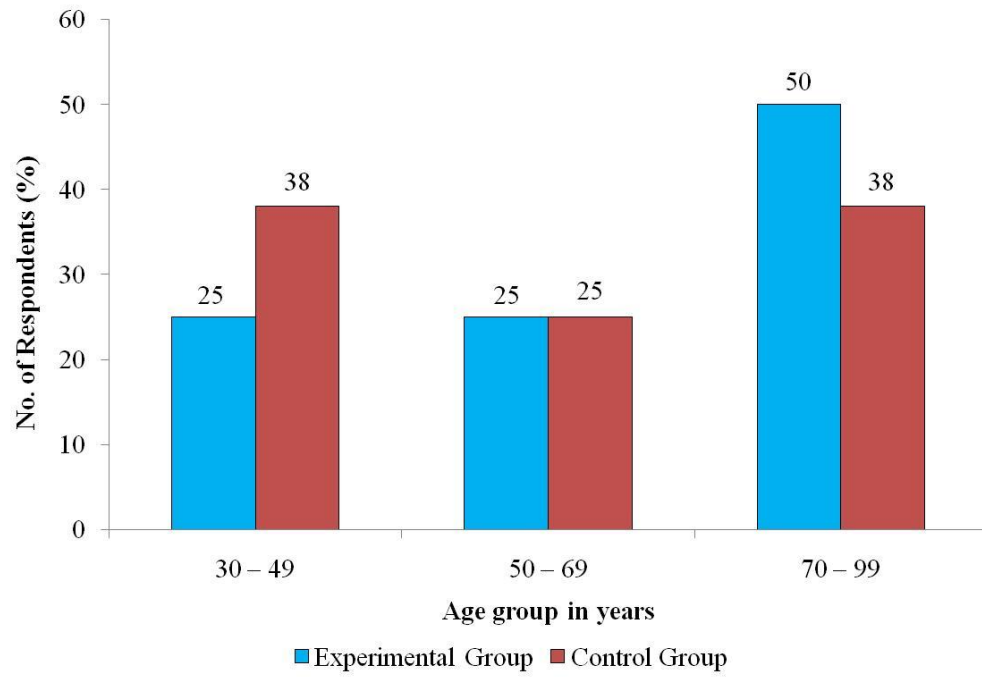
The table reveals that 25 % of stroke patient were between 30 – 49 years of age in experimental group, 38 % in control group. 25 % were between 50 – 69 years of age in experimental group, 25 % in control group. 50 % were between 70 – 99 years of age, 38 % in control group. 75 % of patients were primary education in experimental group, 75 % patient were control group. 25 % of patients were secondary education in control group, 25 % of patients were experimental group. 38 % of patients affected in right side in experimental group, 50 % of patient in control group, 62 % of patient affected left side in experimental group, 50 % of patient affected left side in control group. 62 % of patient affected with ischemic stroke in experimental group, 62 % of patient in control group. 38 % of patient affected with hemorrhagic stroke in experimental group, 38 % of patient in control group. 13 % of patients were working as accountant in experimental group, there is no patient in control group. 13 % of patients were house wife in experimental group, there is no patient in control group. 13 % of patients are cooli worker in experimental group and control group. 13 % of patients were farmer in control group, there is no patient in control group. 62 % of patients were not doing any work in experimental group, 75 % of patients were not doing any job in control group. 62 % of patients were other works in experimental group, 75 % of patients were not doing any other works in control group.

**FIG. 4.1.**  
**AGE DISTRIBUTION**

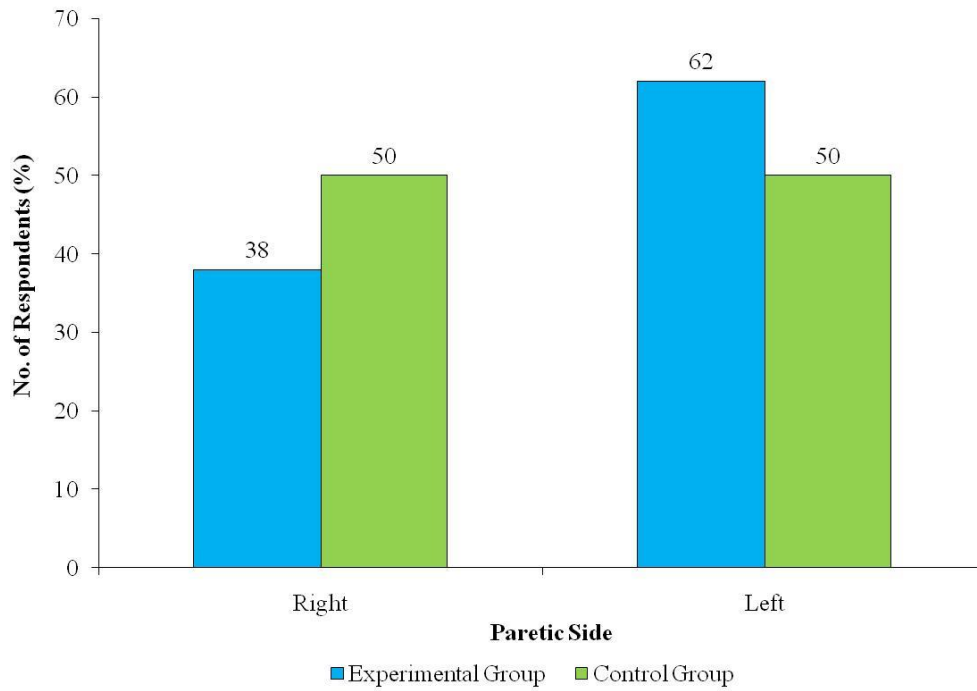




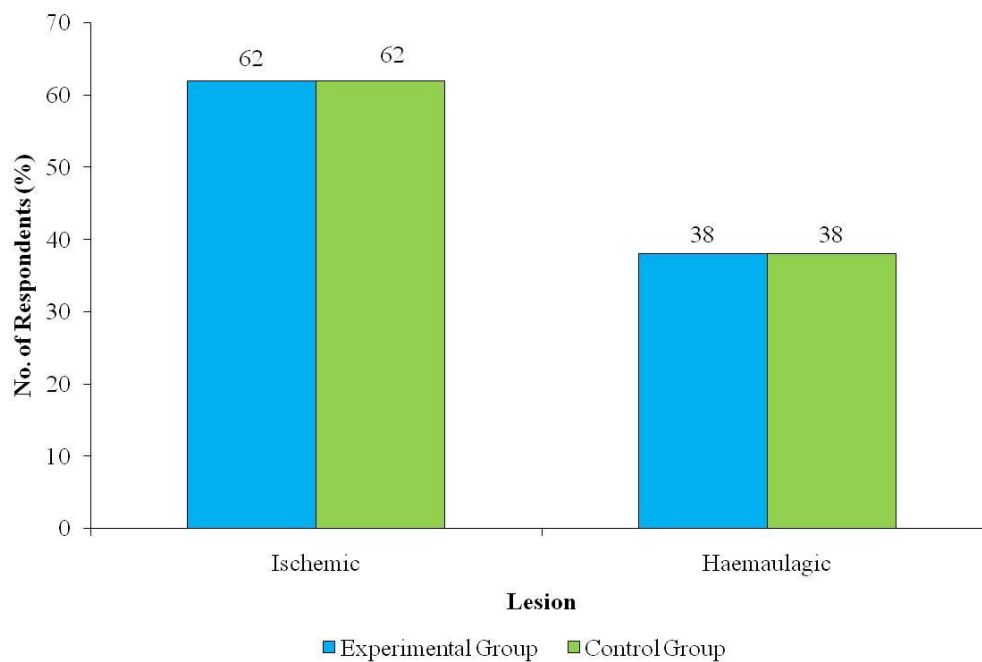
**FIG. 4.2.**  
**DISTRIBUTION OF EDUCATIONAL**  
**STATUS**



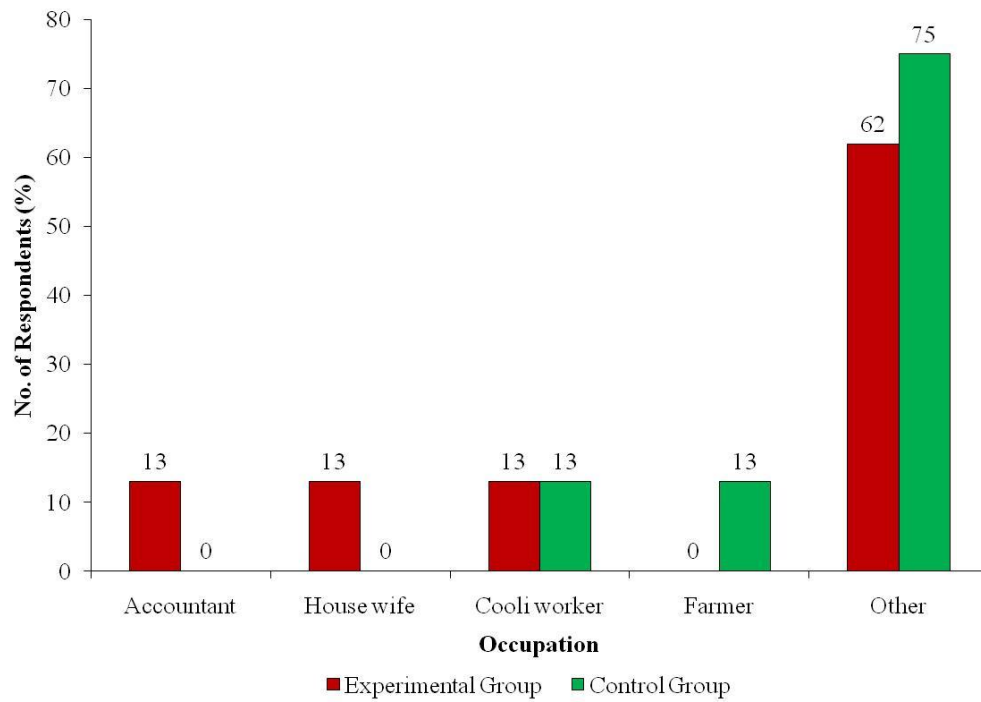
**FIG. 4.3.**  
**DISTRIBUTION OF PARETIC SIDE**



**FIG. 4.4.**  
**DISTRIBUTION OF LESION**



**FIG. 4.5.**  
**DISTRIBUTION OF OCCUPATION**



## SECTION – II

### 4.2. ANALYSIS ON EFFECTIVENESS OF MIRROR THERAPY

Paired 't' test was calculated to find out the progress of hand function by mirror therapy.

**TABLE 4.2.**  
**HAND FUNCTION SCORES BEFORE AND**  
**AFTER MIRROR THERAPY AMONG CONTROL GROUP**

(N=8)

Mirror therapy	Mean	Standard deviation	Mean percentage	Mean Difference	't'
Pre test	53	-	100	1.9	1.870
Post test	52	1.511	98.1		

\*Significant at 0.5 level.

The above table shows that the mean score of Cerebrovascular accident patient the pretest of score using modified Ashworth Scale, Brunnstrom Stage of Recovery, modified FIM Instrument Scale was 100 % and it was decreased to 98.1 % on the post test.

Paired 't' test was applied to find the significant difference in hand functioning score among control group before and after mirror therapy. The calculated value was 1.870 and it was compared with the table value at 0.05 significant levels. The calculated 't' value was less than table value. Hence, **“There is no significance between hand functioning scores of control group before and after mirror therapy.**

**TABLE 4.3.**  
**HAND FUNCTION SCORES BEFORE AND**  
**AFTER MIRROR THERAPY AMONG EXPERIMENTAL GROUP**

(N=8)

Mirror therapy	Mean	Standard deviation	Mean percentage	Mean Difference	't'
Pre test	52.28	2.121	98.58	7.08	3.320
Post test	48.5	2.390	91.56		

\*Significant at 0.5 level.

The above table shows that the mean score of Cerebrovascular accident patient the pretest of score was assessed by modified Ashworth Scale, Brunnstrom Stage of Recovery, modified FIM Instrument Scale was 98.58 % in pretest and it was decreased to 91.56 % on the post test. Standard deviation in the pretest was 2.121.

't' test was used to test the mean significance. The calculated 't' value 3.320 was compared with the table value at 7 degree of freedom with 0.5 level of significance. Hence, the alternative hypothesis, **"There is a significant difference in the hand functioning after mirror therapy among experimental group"**. This reveals that a significant difference exist between the mean score before and after the interventions. Thus the difference is statistically significant and it confirms that the intervention is found to be effective in improving hand function among patient with Cerebrovascular accident.

**TABLE 4.4.**  
**HAND FUNCTIONING SCORES OF EXPERIMENTAL**  
**AND CONTROL GROUP BEFORE MIRROR THERAPY**

(N=8)

Group	Mean	Standard deviation	Mean Percentage	Mean Difference	't'
Experimental Group	52.25	2.121	98.58		
Control Group	53	0	100	2.121	1.00

\*Significant at 0.5 level.

Paired't' test was applied to find the significant difference in hand functioning scores among experimental and control group after mirror therapy. The calculated't' value was 1 and it was compared with the table value at 0.05 significant level. The calculated't' value was less than table value. Hence, **“There no significance difference between experimental and control group before mirror therapy”** is found to be homogeneous.

**TABLE 4.5.**  
**HAND FUNCTIONING SCORES OF EXPERIMENTAL**  
**AND CONTROL GROUP AFTER MIRROR THERAPY**

(N=8)

Group	Mean	Standard deviation	Mean Percentage	Mean Difference	't'
Experimental Group	48.5	2.390	91.50	6.5	3.50**
Control Group	52	1.511	98		

\*\*Significant at 0.010 level.

The above table shows the difference between mean, mean %, standard deviation and 't' value of control group and experimental group after mirror therapy.

The 't' value is found to be greater than the table value. This reveals that there is a significant difference found between control group and experimental group after mirror therapy. Hence, **“There is a significance difference between experimental and control group after mirror therapy”**. Though there is a difference observed in the control group, which is less than the value of experimental group. This result strengthens the interventional effect in the experimental group.

## **RESULTS AND DISCUSSION**

This chapter deals with the interpretation of results and discussion of findings. The study was conducted at Sri Ramakrishna Hospital, Coimbatore. The present study was intended to assess the effect of Mirror therapy on hand function among Cerebrovascular accident patient.

Mirror therapy was given to 16 patients who were suffered Cerebrovascular accident with upper limb weakness. Mirror therapy was given for one month, with three sessions for a day each session lasts 30 minutes along with rehabilitation. Results are evaluated with Brunnstrom Stage of motor recovery, modified Ashworth scale and FIM instrument. Demographic datas were recorded.

### **5.1. FINDINGS RELATED TO DEMOGRAPHIC DATA**

#### **5.1.1. Age distribution**

Table reveals that 6.25 % of Cerebrovascular accident was between 30-49 years of age, 68.75 % were between 50-69years of age and 25 % were between 70-99 years of age.

#### **5.1.2. Educational status**

The above table reveals that reveals that 75 % of patient were primary education, 25 % of them were secondary education.

#### **5.1.3. Occupation**

The above table reveals that 6.25 % of patient as accountant, house wife and farmer, 12.5 % of patient working as coli worker, 68.75 % of patient are not doing any job.



#### **5.1.4. Paretic side**

The table reveals that 43.75 % of patient affected in right side, 56.25 % of them were affected in left side of the hand.

#### **5.1.5. Type of lesion**

The table reveals that 62.5 % of patient affected with Ischemic stroke and 37.5 % of patient affected with Hemorrhagic stroke.

#### **5.1.6. Occupation**

The above table reveals that 6.25 % of patient as accountant, house wife and farmer, 12.5 % of patient working as coli worker, 68.75 % of patient are not doing any job.

### **5.2. FINDINGS RELATED TO EFFECT OF MIRROR THERAPY ON HAND FUNCTIONING ON USING MODIFIED ASHWORTH SCALE, BRUNNSTROM RECOVERY STAGE AND MODIFIED FIM SELF CARE SCALE**

#### **5. 2.1. Assessment of Hand Functioning Scores of Control Group before and After Mirror Therapy**

Table 4.2 shows that 8 patients were assigned to control group and their hand functioning score was assessed, before and after Mirror therapy. The mean hand functioning score before mirror therapy was 53 and after rehabilitation was 52 in control group. This reveals that there was a hand functioning and 't' value was found be 1.870. Hence, the hypothesis  $H_{01}$ : "There is no significant difference between

the hand functioning scores of control group before and after mirror therapy” is rejected.

### **5.2.2. Assess of the Hand Functioning Scores of Experimental Group Before and After Mirror Therapy**

Table 4.3 shows that 8 patients were assigned to experimental group and their hand functioning score was assessed before and after mirror therapy. The main hand functioning scores before mirror therapy was 52.28 and after mirror therapy was 48.5 in experimental group. This reveals that there was a hand functioning and ‘t’ value was found to be 3.320. Hence, the hypothesis **H<sub>2</sub>: “There is significant difference between the hand functioning score of experimental group before and after mirror therapy”** is accepted.

### **5.2.3. Assessment of Hand Functioning Scores in Experimental and Control Group Before and After Mirror Therapy**

Table 4.3 reveals that 16 patients were randomly assigned to experimental group and control group. Hand functioning scores were assessed using modified Ashworth scale for spasticity, motor recovery assessed by Burnnstrom Scale and hand functioning assessed by modified FIM Instrument scale. The mean hand functioning score of experimental group was 52.25 and mean pain intensity score of control group was 53. The ‘t’ values was found to be 1. Hence the hypothesis **H<sub>03</sub>: There is no significant difference between the hand functioning score of experimental and control group before mirror therapy”** is accepted. Since the two groups are found to be homogenous.

#### **5.2.5. Comparison of Hand Functioning Score in Experimental and Control Groups Before and After Mirror Therapy**

With regards to the hand functioning score 16 patients were randomly assigned to experimental and control group. Hand functioning scores were assessed before and after administration of mirror therapy by modified Ashworth Scale for Spasticity, motor recovery assessed by Brunnstrom Scale and hand related functioning assessed by modified FIM instrument scale. Paired 't' test was used to prove the significance of this therapy. Table 4.4 and 4.5 were compared, Table 4.4 depicts the hand function score of experimental group before and after mirror therapy. The mean percentage was 98.58 before administration of mirror therapy was greater than the mean percentage of experimental group was 98.1 and 91.56. Although, the sample was small, there is an indication that mirror therapy has an quicker positive effect on patient with Cerebrovascular accident. The 't' value was found to be 3.320.

## SUMMARY AND CONCLUSION

The present study was conducted with the objectives to explore the effect of mirror therapy for hand function among Cerebrovascular accident patient. Mirror therapy implementation promotes hand function. Initially, assessment was done and the patients were identified through movement of hand. Mirror therapy was implemented to the experimental group mother, where as no intervention given to the control group patient. Modified Ashworth Scale, Brunnstrom Stage Recovery, and Modified FIM instrument for self-care scale was used to assess the hand function in both experimental and control group. There was a significant difference in hand function of the patient between experimental and control group after the implementation of mirror therapy.

General system theory was adopted to identify the need of patient.

Review of literature reveals many facts about various alternative and complementary therapies for hand function and highlighted the effect of mirror therapy to improve the hand function of patient among Cerebrovascular accident patient.

The study was conducted in the Neuro ward of Sri Ramakrishna Hospital, Coimbatore. Quasi experimental pretest-post test with control design was adopted for the study. Convenient Sampling Technique was used to select the respondents. Total number of respondents selected was 16. Samples were assigned to experimental and control group.

The baseline information like, hand function were collected and hand functions were assessed by using modified Ashworth Scale, Brunnstrom Stage Recovery, FIM Instrument for self care scale in the both experimental and control group. The mirror therapy was implemented to experimental group respondents whereas no intervention given to control group. The same scale was used for assessing hand function before and after mirror therapy in experimental and control group for initial and end assessment. To find out the effect of mirror therapy, paired 't' test was used. The result reveals that there is a significant improvement of hand function among Cerebrovascular accident patient after the implementation of mirror therapy.

#### **6.1. MAJOR FINDINGS OF THE STUDY**

- i. The demographic data reveals that maximum number of respondents was found in the age group of 70-99 years in experimental group whereas 37.5 % in the control group.
- ii. Majority of respondent (70 %) were found as primary education in both experimental and control. The demographic data reveals that maximum number of respondents (50 %) group.
- iii. Maximum number of respondents (62.5 %) affected left side in experimental group control group 50 %.
- iv. Majority of the respondent (62.5 %) were affected with Ischemic stroke in both experimental and control group.
- v. Maximum number of respondents in experimental group (62.5 %) not doing any work in control group (75 %).
- vi. After the implementation of mirror therapy there was a significant improvement in the hand function of experimental group.

## **6.2. LIMITATIONS OF THE STUDY**

The study was confined to a small number respondents and shorter period that limits the generalization.

## **6.3. IMPLICATIONS**

### **6.3.1. Nursing Education**

Complementary and alternative therapies are those therapies that are used in addition to conventional treatment recommended by health care provider. There exists several types of complementary therapies and one among them is mirror therapy that is nursing accessible therapy. So the nurses should update their knowledge and skills. This mirror therapy can be very well incorporate as an alternative therapy in curriculum as a part of holistic approach.

### **6.3.2. Nursing Practice**

Mirror therapy is one of the complementary therapy in which there exist so many added benefits to hand functions. It is simple and cost effective therapy with no side effects. So it can be administered along with other pharmacological and rehabilitation interventions. Hence the researcher should have the in-service education regarding, how to implement mirror therapy in order to increase the hand function among Cerebrovascular accident patients.

### **6.3.3. Nursing Research**

Continuing research activity and health education will make the public to understand the importance and in service education for health personnel, will helps to improve the comfort of mothers during the labour process.

#### **6.4. RECOMMENDATIONS**

1. Mirror visual feedback can be compared with other therapeutic approaches to get good results.
2. The study could be carried out with the long term follow-up and large sample size.
3. More research is needed to further explore the real benefits on mirror visual feedback approach in reducing post-stroke disability.
4. Dominant and non-dominant involvement could be analysed separately.
5. Lower limb rehabilitation can also be done.

#### **CONCLUSION**

The hand function of stroke patient is an inevitable event irrespective of age, and paralytic side of the stroke patient. There are many non pharmacological approaches were tested to improve the comfort level of the stroke patient by improving hand function, in that mirror therapy proved to be more effective in improving hand function. Hence, the mirror therapy intervention can be incorporates as a nursing implication to promote comfortness of the stroke patient.

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**APPENDIX – I**  
**PERMISSION LETTER FOR CONDUCTING STUDY**

From  
**S. Aneesh Fathima,**  
M.Sc Nursing I year,  
College of Nursing,  
Sri Ramakrishna Institute of Paramedical Sciences,  
Coimbatore -44.

To  
**The Dean,**  
Sri Ramakrishna Hospital,  
Coimbatore.

Through  
**The Principal,**  
College of Nursing,  
Sri Ramakrishna Institute of Paramedical Sciences,  
Coimbatore -44.

Sub: Letter requesting permission for conduct the research study.

Respected Sir,

I S. Aneesh Fathima, doing my M.Sc (N) I Year in College of Nursing, Sri Ramakrishna Institute of Paramedical Sciences, as a part of my curriculum requirement under The Tamil Nadu Dr. M.G.R. Medical University has to conduct Research, I have selected study on **“EFFECTIVENESS OF MIRROR THERAPY ON HAND RELATED FUNCTIONING AMONG PATIENTS WITH CEREBROVASCULAR ACCIDENT”**.

I kindly request you grant me permission. I assure that I will abide the rules of the institution and information collected from the study participants will not be disclosed.

Thanking you,

Yours faithfully,

Coimbatore

Date:

Permitted  
6/2/11  
9/3/11.

*K. Ramakrishnan*  
(S. ANEESH FATHIMA)  
for **PRINCIPAL**  
College of Nursing,  
Sri Ramakrishna Institute of Paramedical Sciences  
Coimbatore - 641 044.

From  
**S. Aneesh Fathima,**  
M.Sc Nursing I year,  
College of Nursing,  
Sri Ramakrishna Institute of Paramedical Sciences,  
Coimbatore -44.

To  
**Dr. Asokan, M.D. (Medicine) D.M. (Neuro),**  
Sri Ramakrishna Hospital,  
Coimbatore.

Through  
**The Principal,**  
College of Nursing,  
Sri Ramakrishna Institute of Paramedical Sciences,  
Coimbatore -44.

Sub: Letter requesting permission for conduct the research study.

Respected Sir,

I S. Aneesh Fathima, doing my M.Sc (N) I Year in College of Nursing, Sri Ramakrishna Institute of Paramedical Sciences, as a part of my curriculum requirement under The Tamil Nadu Dr. M.G.R. Medical University has to conduct Research, I have selected study on **"EFFECTIVENESS OF MIRROR THERAPY ON HAND RELATED FUNCTIONING AMONG PATIENTS WITH CEREBROVASCULAR ACCIDENT"**.

I kindly request you grant me permission. I assure that I will abide the rules of the institution and information collected from the study participants will not be disclosed.

Thanking you,

Yours faithfully,

Coimbatore

Date:

(S. ANEESH FATHIMA)

*for R. Ramathilagam*  
**PRINCIPAL**  
College of Nursing,  
Sri Ramakrishna Institute of Paramedical Sciences  
Coimbatore - 641 044.

*[Signature]*  
11-5-11

### APPENDIX – III TOOL FOR DATA COLLECTION

#### I. DEMOGRAPHIC DATA

Name of the patient :  
 Age :  
 Gender :  
 Education :  
 Occupation :  
 Paretic Side (Right/ Left) :  
 Lesion Type (Ischemic/ Hemorrhagic) :  
 Time of Diagnosis :

#### MODIFIED ASHWORTH SCALE

R/L	Movements	Score

#### The Modified Ashworth Scale

0 – No increase in muscle tone  
 1 – Slight increase in tone with a catch and release or minimal resistance at end of range.  
 2- As 1 but with minimal resistance through range following catch.  
 3- More marked increase tone through ROM.  
 4- Considerable increase in tone, passive movement difficult.  
 5- Affected part rigid.

**BRUNNSTROM MOTOR RECOVERY STAGES**

<b>Stages</b>	<b>Description</b>	<b>Patient Status</b>
Stage 1	Initial flaccidity – no voluntary movement	
Stage 2	Emergence of spasticity, hyper-reflexia, synergies (mass patterns of movement)	
Stage 3	Voluntary movements possible, but only in synergies, spasticity strong.	
Stage 4	Voluntary control in isolated joint movements emerging, corresponding decline of spasticity and synergies.	
Stage 5	Increasing voluntary control out-of-synergy; coordination deficits present.	
Stage 6	Control and coordination near normal	

**FIM INSTRUMENT ITEMS**

<b>Motor items</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
1. Eating							
2. Grooming							
3. Bathing							
4. Dressing – upper body							
5. Dressing – Lower body							
6. Toileting							

## FORMAT FOR CONTENT VALIDITY

Name of the expert: DR. S. MADHAVI,

Address: Principal & Prof. of Medical Surgical Nsg,  
KMC College of Nursing,  
Coimbatore - 14.

Kindly validate each tool and tick wherever applicable

S.No	Sections of the tool	Strongly agree	Agree	Needs modification	Remarks
1	SECTION A	✓			
2	SECTION B		✓		
3	SECTION C			✓	

Total content for the tool : Adequate /Inadequate

In my opinion the FM scale in toto may not be applicable to reflect the mirror therapy's effect. Items such as bladder control has nothing to do with mirror therapy.

Date:

Signature of the expert



The Principal  
K.M.C.H. College of Nursing;  
P.B.No: 3209, Avinashi Road,  
Coimbatore - 641 014.

### FORMAT FOR CONTENT VALIDITY

Name of the expert: Dr. ASOKAN, M.D (Medicine) D.M. (Neuro),


Address: Sri Ramakrishna Hospital,  
Coimbatore

Kindly validate each tool and tick wherever applicable

S.No	Sections of the tool	Strongly agree	Agree	Needs modification	Remarks
1	SECTION A	✓			
2	SECTION B	✓			
3	SECTION C			✓	

Total content for the tool : Adequate / Inadequate ✓

Date:

  
Signature of the expert

## FORMAT FOR CONTENT VALIDITY

Name of the expert: MR. P. KUZHANTHAIVEL

Address: KMCH COLLEGE OF NURSING,  
POST BOX: 3209, AVINASHI ROAD,  
COIMBATORE - 641014

Kindly validate each tool and tick wherever applicable

S.No	Sections of the tool	Strongly agree	Agree	Needs modification	Remarks
1	SECTION A	✓			
2	SECTION B	✓			
3	SECTION C		✓		

Total content for the tool : Adequate / Inadequate

Date: 13.06.2011

P. Kuzhantivel  
Signature of the expert



## ANNEXURE - I

### Paired 't' test

To test the hypothesis, 't' test was applied to find out the significant difference between before and after mirror therapy.

$$t = \frac{\bar{d}}{\frac{SD}{\sqrt{n}}}$$

$$SD = \sqrt{\frac{\sum (x - \bar{d})^2}{n}}$$

$\bar{d}$  = Mean of difference between pretest and post test score

SD = Standard deviation of the pre-test and post test score

n = Number of samples

**ANNEXURE - II****ANNEXURE – II****Unpaired‘t’ test**

To test the hypotheses unpaired‘t’ test was applied to find out the significant difference after mirror therapy in experimental and control group.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S} \sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

$$S^2 = \frac{\sum (X_1 - \bar{X}_1)^2 + \sum (X_2 - \bar{X}_2)^2}{n_1 + n_2 - 2}$$

Where,  $\bar{X}_1$  = mean of the first sample

$\bar{X}_2$  = mean of the second sample

$n_1$  = number of observation in the first sample

$n_2$  = number of observation in the second sample

$S$  = Combined standard deviation